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LISTS OF SPECIES

Mammals of medium and large size in Santa Rita do Sapucaí, Minas Gerais, southeastern Brazil

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Abstract: The diversity of Brazilian vertebrates is regarded among the highest in the world. However, the biological diversity is still mostly unknown and a good part of it is seriously threatened by human activities. This study aimed to inventory the medium and large size mammals present in the *Reserva Biológica de Santa Rita do Sapucaí*, an Atlantic forest reserve located in Santa Rita do Sapucaí, southeastern Brazil. Sand-plots, photographic traps and searches for animal tracks on pre-existent trails in the area, were carried out once every two months between May 2006 and February 2007. The sand-plots and tracks were inspected during five consecutive days per sampling. We obtained 108 records of 15 species, mostly of carnivorans. Two confirmed species are threatened with extinction in Brazil (*Callithrix aurita* and *Leopardus pardalis*). The results suggest that the sampled reserve has high species richness and plays an important role in conservation of mammals in this landscape, including species threatened with extinction.

Introduction

Brazil has a high diversity of vertebrates and is considered as having the largest biodiversity in the world (Drummond et al. 2005). Of the 4900 plus species of mammals in the world, approximately 12% (658) occur in Brazil. However, this diversity is still widely unknown and a great part of it is seriously threatened by human activities (Drummond et al 2005).

The Atlantic forest biome shelters much of the Brazilian mammal diversity, having approximately 250 listed species (38% of the Brazilian diversity), of which 55 are endemic (Reis et al. 2006). This diversity combined with the high degree of human disturbance led Mittermeier et al. (2005) to consider it a hotspot. Due to this elevated degree of threat and the ecological relevance of mammals, the importance of collecting information on medium and large sized mammals in Atlantic Forest is evident (Pardini et al. 2003).

Moreover, the shortage of data on composition and species abundance on a local and regional level of medium and large size mammals makes the evaluation of a conservation status at a national level difficult (Rocha and Dalponte 2006). For this reason the present study aimed to provide the first inventory and preliminary data on the relative abundance of medium and large size mammals for the region of Santa Rita do Sapucaí, a municipality situated in a highly fragmented and poorly studied rainforest landscape of southern Minas Gerais state.

Materials and methods

Study Site

This study was carried out in *Reserva Biológica Municipal de Santa Rita do Sapucaí* (RBSRS) located at 22°12'17.08" S and 45°44'19.87" W, an expressive forest remnant for the region (Figure 1), with 300 ha of area . The area is inserted in the Atlantic Forest biome, being classified as "*Floresta Tropical Latifoliada Baixo Montana*" (lower-montane tropical forest *sensu* Rizzini, 1963), with transition between "*Floresta ombrófila mista*" (mixed ombrophilous forest) and "*Floresta estacional semidecidual*" (seasonally-semideciduous forest) sensu IBGE (2004).

The climate of the region presents two seasons: wet season, between October and March, and dry

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season, between April and September. The average annual precipitation is around 1,500 mm and the average temperature 18° C. The extreme temperatures can reach close to 0° C in winter and around 32° C in summer (Instituto Nacional de Meteorologia, 2009).

Data collection

In this study, we followed the definition of mammal size proposed by Emmons and Feer (1997) who considered medium-sized mammals as those weighing between 2 and 7 kg, while the species with more than 7 kg were considered to be of large size. The taxonomic nomenclature followed Wilson and Reeder (2005).

Some species (*Guerlinguetus ingrami, Callitrix penicillata, Callithrix jacchus, Didelphis albiventris, Cavia* sp.), altought not classify as medium or large mammals, were listed in this study because they could be identified with certainty. Primates were also included because they are commonly listed on studies of mammals of medium and large size (Rocha-Mendes et al. 2005; Scoss et al. 2004; Rocha and Dalponte 2006; Negrão and Valladares-Pádua 2006; Santos et al. 2008).

The following methodologies were used in the study site: (1) footprint trap (sand-plot), (2) searching for animal tracks and (3) photographic trap. Footprint trap were randomly arranged in four trails created by resident farmers. Trails were located in the edge and the interior of the forest. We sampled 11 sand-plots, each 50 X 50 cm in size, placed at a minimum distance of 50 meters between each other. Searching for animal track was carried out from May 2006 to February 2007. In each month, all trails were checked daily for five consecutive days. The footprints found in the sand-plots (footprint trap) were identified using Becker and Dalponte (1999) and Oliveira and Cassaro (2005) guides. One photographic trap (Trapa-câmera®, 35 mm film model) was installed sporadically in points of the study area. This last method was used only to aid in the species richness inventory.

The relative abundance index of species (RAI) was calculated by dividing the number of records of each species by the total number of records of all species. Only the species recorded in sand-plots were considered for RAI and Felidae species were not distinguished, being identified only to the genus level (*Leopardus* sp.).

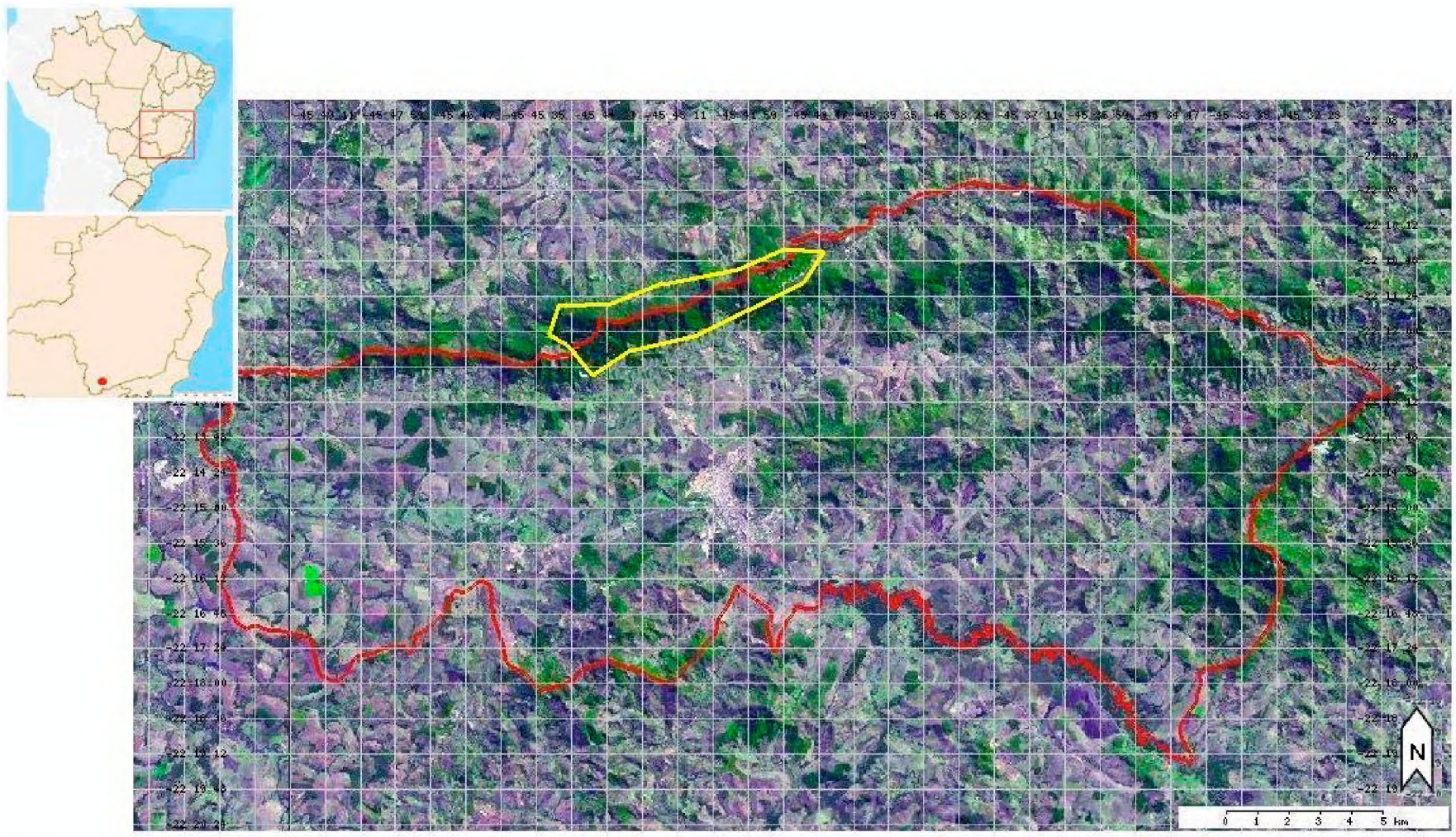

Figure 1. Map showing the Santa Rita do Sapucaí municipality limits (red line) and study site (yellow line). The location of the municipality in Minas Gerais State is shown by the red dot in the upper left detail.

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Results and Discussion

In total fifteen species were recorded in the area, being one marsupial, one cingulate, three primates, five carnivores, four rodents and one lagomorph (Table 1). Two species (*Callithrix aurita* and *Leopardus pardalis*) are cited in the Brazilian red list of endangered species (Machado et al., 2008) and seven species (*Didelphis albiventris, Dasypus novemcinctus, Cerdocyon thous, Eira barbara, Procyon cancrivorus, Callicebus nigrifrons* and *Silvilagus brasiliensis*) are generalist or opportunist in habits (Fonseca et al. 1996; Negrão and Valladares-Pádua 2006; Trevelin et al. 2007). In 80 days of data collection by sand plots, 108 records were obtained, resulting in a sampling success of 1.35 records/day. We identified 11 medium and large-sized mammal species in 71 out of 108 footprints recorded (65.74%).

In *Parque Estadual do Rio Doce* (approximately 36,000 ha), Scoss et al. (2004) recorded 16 species of medium and large sized mammals, five of which are present in RBSRS (*Procyon cancrivorus, Dasypus novemcinctus, Guerlinguetus ingrami, Eira barbara* and *Cerdocyon thous*). The absence of records of larger size species in our study, such as *Puma concolor* and *Tapirus terrestris*, can be attributed to the smaller size of study the area as well as to anthropogenic disturbances, such as illegal hunting, extraction of timber and invasion by domestic animals (see Oliveira, et al. 2008; Srbeck-Araújo and Chiarello, 2008).

Negrão and Valladares-Padua (2006) carried out a study in the Reserva Florestal do Morro Grande (state of São Paulo) and found predominantly species of generalist mammals and argued that this finding indicates a high degree of disturbance and low quality of that area. Similarly, the community of mammals found in the Biological Reserve of Santa Rita Sapucaí probably reflects the history of anthropogenic disturbances in this area. It is emphasized that the common species between the RBSRS and other lists of mammals species found in the literature (Rocha-Mendes et al. 2005; Scoss et al. 2004; Rocha and Dalponte 2006; Negrão and Valladares-Pádua 2006; Santos et al. 2008) were basically the same, except species of the genus *Cavia* sp. and *Leopardus* sp., which are mentioned less frequently in the literature.

Of the 11 species considered for the footprints analysis, *Leopardus* sp. and *Dasypus novemcinctus* presented the highest indices of relative abundance (RAI = 0.0925 and RAI = 0.0925, respectively). The *Dasyprocta* sp. (RAI = 0.0185) presented the lowest index (Figure 2).

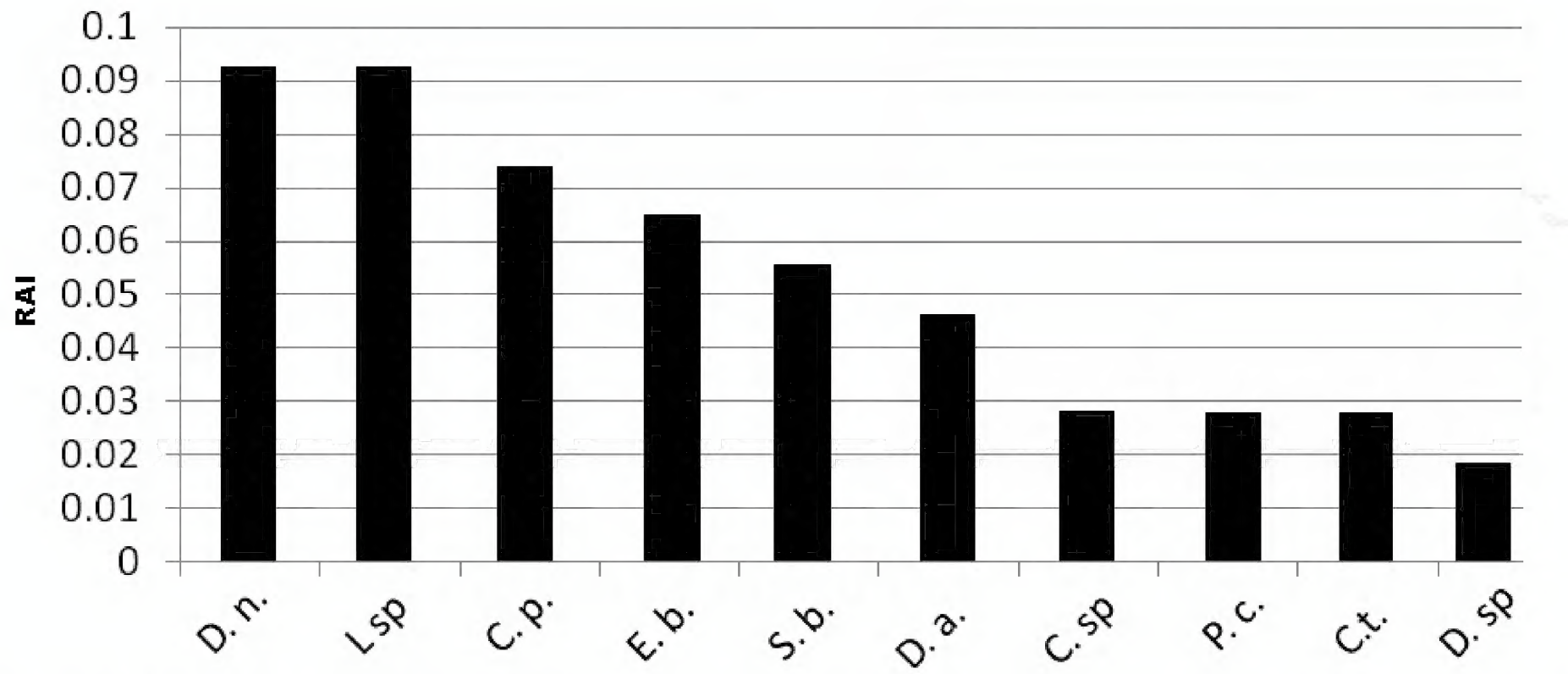

Figure 2. Relative abundance index (RAI) of species with footprint records. D. n. = *Dasypus novemcinctus;* L. sp. = *Leopardus* sp.; C. p. = *Cuniculus paca;* E. b. = *Eira barbara*; S. b. = *Sylvilagus brasiliensis;* D. a. = *Didelphis albiventris;* C. sp. = *Cavia* sp.*;* P. c. = *Procyon cancrivorus;* C. t. = *Cerdocyon thous;* D. sp. = *Dasyprocta* sp.

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Table 1. Medium and large size mammals of *Reserva Biológica de Santa Rita do Sapucaí*, Minas Gerais, southeastern Brazil.

TAXON	COMMON NAME	RECORD
DIDELPHIMORPHIA		
Family Didelphidae		
Didelphis albiventris Lund, 1840	White-eared Opossum	Footprints and camera trap
CINGULATA		
Family Dasypodidae		
Dasypus novemcinctus Linnaeus, 1758	Nine-banded Armadillo	Footprints, camera trap and burrows
PRIMATES		
Family Atelidae		
Alouatta guariba (Humboldt, 1812)	Brown Howler Monkey	Sightings and vocalizations
Family Callitrichidae		
Callithrix aurita (É. Geoffroy in Humboldt, 1812)	Buffy-tufted Marmoset	Sightings and vocalizations
Family Pitheciidae		
Callicebus nigrifrons (Spix, 1823)	Black-fronted Titi	Sightings and vocalizations
CARNIVORA		
Family Canidae		
Cerdocyon thous (Linnaeus, 1766)	Crab-eating Fox	Footprints
Family Felidae		
Leopardus pardalis (Linnaeus, 1766)	Ocelot	Footprints and camera trap.
Leopardus *sp. Gray, 1842*		Footprints
Family Mustelidae		
Eira barbara (Linnaeus, 1758)	Tayra	Footprints and camera trap
Family Procyonidae		
Procyon cancrivorus (G. [Baron] Cuvier, 1798)	Crab-eating Raccoon	Footprints and camera trap
RODENTIA		
Family Agoutidae		
Cuniculus paca (Linnaeus, 1758)	Paca	Footprints and camera trap
Family Caviidae		
Cavia *sp. Pallas, 1766*	Brazilian Guinea Pig	Footprints
Family Dasyproctidae		
Dasyprocta sp. Illiger, 1811	Agouti	Footprints
Family Sciuridae		
Guerlinguetus ingrami (Linnaeus, 1766)	Brazilian Squirrel	Sightings
LAGOMORPHA		
Family Leporidae		
Sylvilagus brasiliensis (Linnaeus, 1758)	Brazilian Rabbit	Footprints and camera trap

It is worth emphasizing that such indices of relative abundance express the frequency of records of each species in relation to the frequency of records of all species in the area (Jorge 1986, Walker et al. 2000), thus estimating the frequency with which each species occurs in the area of study. Therefore, the effective size of populations of each species can not be deduced from these data (Walker et al. 2000).

In *Parque Estadual do Rio Doce*, the species with highest abundance index were *Dasyprocta* sp., *Didelphis* sp., *Sylvilagus brasiliensis* and *Cuniculus paca* (Scoss et al. 2004). It was observed that *Dasyprocta* sp. presents a much higher abundance in Rio Doce than in the present study. In *Reserva Florestal do Morro Grande*, Negrão and Valladeres-Pádua (2006) reported that the greatest abundance of footprints were those of

the smallest species (*Guerlinguetus ingrami, Didelphis aurita* and *Sylvilagus brasiliensis*). In RBSRS, both species of larger sizes such as *Leopardus* sp. and *Cerdocyon thous* as well as smaller species such as *Sylvilagus brasiliensis* and *Cavia* sp. had a varied abundance of footprint records. This discrepancy found between sites could be due to several factors, including differences in community structure, degree of disturbance of area and experimental design.

The results indicate that the study site presents a considerable diversity of medium and large size mammals, including two species endangered with extinction. Thus, the municipality area of Santa Rita do Sapucaí plays an important role regionally for mammal conservation. The data generated in this study will be important for supporting conservation and management strategies in RBSRS, besides offering subsidies to subsequent faunal studies.

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Literature cited

Becker, M and J. C. Dalponte. 1999. Rastros de mamíferos silvestres brasileiros: um guia de campo. Brasíia. Editora IBAMA. 180 p.

Colli, G. R., Accacio, G. M., Antonini, Y., Constantino, R., Franceschinelli, E. V., Laps, R. R., Scariot, A., Vieira, M. V. e Wiederhecker, H. C. 2003. A Fragmentação dos Ecossistemas e a Biodiversidade Brasileira: Uma Síntese; p. 317-324 *In* D. M. Rambaldi and D. A. S. Oliveira (eds.). Fragmentação de Ecossistemas: Causas, efeitos sobre a biodiversidade e recomendações de políticas públicas. Brasília: Ministério do Meio Ambiente/Secretaria de Biodiversidade e Florestas.

Drummond, G. M., C. S. Martins, A. B. Machado, F. A. Sebaio, and Y. Antonini. 2005. Biodiversidade em Minas Gerais: um Atlas para sua conservação. Belo Horizonte. Fundação Biodiversitas. 222 p.

Emmons, L.H. and F. Feer. 1997. Neotropical Rainforest Mammals. Chicago. University of Chicago Press. 380p.

Fonseca, G. A., G. Herrmann, Y. L. R. Leite, A. B. R. Mittermeier and J. L. Patton. 1996. Lista anotada dos mamíferos do Brasil. Occasional Papers in Conservation Biology (4): 1-38.

Instituto Brasileiro de Geografia e Estatística. 2004. Mapa de Vegetação do Brasil. Electronic Database accessible at ftp://ftp.ibge.gov.br/Cartas_e_Mapas/Mapas_Murais/. Ministério do Planejamento, Orçamento e Gestão, Instituto Brasileiro de Geografia e Estatística, Diretoria de Geociências, Brasil. Captured on July 2008.

Instituto Nacional de Meteorologia. 2009. Consulta de Dados da Estação Automática: Maria de Fé, MG. Database accessible at http://www.inmet.gov.br/sonabra/maps/automaticas.php Captured on April 2009.

Jorge, J. L. T. 1986. Manual para el censo de los vertebrados terrestres. Madrid. Editora Raíces. 278 p.

Machado, A.; G.M. Drummond, and A.P. Paglia. 2008. Livro vermelho da fauna brasileira ameaçada de extinção, 1ª ed. Brasília, DF: Ministério do Meio Ambiente. 1420 p.

Mittermeier, R. A., P. R. Gil, M. Hoffmann, J. Pilgrin, T. Brooks, C. G. Mittermeier, J. Lamoreux, and G. A. B. Fonseca. 2005. Hotspots revisited. Earth's biologically richest and most endangered terrestrial ecoregions. Sierra Madre: Cemex. 392 p.

Negrão, M. F. F. and C. Valladares-Pádua. 2006. Records of mammals of larger size in the Morro Grande Forest Reserve, Sao Paulo. Biota Neotroprica 6(2). Eletronic Database accessible at http://www.scielo.br/pdf/bn/v6n2/v6n2a05.pdf. Program BIOTA/FAPESP: The Virtual Institute of Biodiversity, São Paulo, SP. Captured on June 2008.

Oliveira, T. G. and K. Cassaro. 2005. Guia de campo dos felinos do Brasil. São Paulo. Instituto Pró-carnívoros, Fundação Parque Zoológico de São Paulo, Sociedade de Zoológicos do Brasil, Pró-Vida Brasil. 80 p.

Oliveira, V. B.; A. M. Linares; G. L. C. Corrêa; and A. G. Chiarello. 2008. Predation on the black capuchin monkey *Cebus nigritus* (Primates: Cebidae) by domestic dogs *Canis lupus familiaris* (Carnivora: Canidae), in the Parque Estadual Serra do Brigadeiro, Minas Gerais, Brazil. Revista Brasileira de Zoologia 25(2): 376-378.

Pardini, R., E. H. Ditt, L. Cullen Jr, C. Bassi, and R. Rudran. 2003. Levantamento rápido de mamíferos

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terrestres de médio e grande porte; p. 181-201 *In* Cullen Júnior, L., R. Rudran, and C. Valladares-Pádua (org.). Métodos de estudos em biologia da conservação e manejo da vida silvestre. Curitiba. Universidade Federal do Paraná. 667 p.

Reis, N. R., A. L. Peracchi, W. A. Pedro, and I. P. Lima. 2006. Sobre os mamíferos brasileiros; p. 17-25 *In* Reis, N. R., A. L. Peracchi, W. Pedro, and I. P. Lima (ed.). Mamíferos do Brasil. Londrina. Universidade Estadual de Londrina.

Rizzini, C. T. 1963. Nota prévia sobre a divisão fitogeográfica (florístico-sociológica) do Brasil. Revista Brasileira de Geografia 25(1): 3-64.

Rocha, E. C. and J. Dalponte. 2006. Composição e caracterização da fauna de mamíferos de médio e grande porte em uma pequena reserva de Cerrado em Mato Grosso, Brasil. Revista árvore 30(4): 669-678.

Rocha-Mendes, F., S. B. Mikich, G. V. Bianconi, and W. A. Pedro. 2005. Mamíferos do município de Fênix, Paraná, Brasil: etnozoologia e conservação. Revista Brasileira de Zoologia 22(4): 991-1002.

Santos, T. G., M. R. Spies, K. Koop, R. Trevisan, and S. Z. Cechin. 2008. Mamíferos do campus da Universidade Federal de Santa Maria, Rio Grande do Sul, Brasil. Biota Neotropica 8(1): 125-131.

Scoss, L. M., P. M. Júnior, E. Silva, and S. V. Martins. 2004. Uso de parcelas de areia para o monitoramento de impacto sobre a riqueza de espécies de mamíferos. Revista Árvore 28(1): 121-127.

Srbek-Araujo, A. C. and A. G. Chiarello. 2008. Domestic dogs in Atlantic forest reserves of south-eastern Brazil: a camera-trapping study on patterns of entrance and site occupancy rates. *Braz. J. Biol.* 68(4): 771-779.

Trevelin, L. C., M. Port-Carvalho, M. Silveira, and E. Morell. 2007. Abundância, uso do habitat e dieta de *Callicebus nigrifrons* É. Geoffroy (Primates, Pitheciidae) no Parque Estadual da Cantareira, São Paulo, Brasil. Revista Brasileira de Zoologia 24(4): 1071-1077.

Walker, R. S., A. J. Novaro, and J. D. Nichols. 2000. Consideraciones para la estimacion de la abundancia de poblaciones de mamíferos. Mastozoologia Neotropical, Journal of Neotropical Mammology 7(2):73-80.

Wilson, D. E. and D. M. Reeder (ed.). 2005. Mammal Species of the World. A Taxonomic and Geographic Reference (3rd ed.). Washington: Johns Hopkins University Press, 2, 142 p.

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